SOME ANCIENT MAMMAL PORTRAITS.

VERY little attention appears to have been hitherto devoted to the correct identification of the wild animals represented in the ancient Assyrian and Babylonian sculptures, and in the frescoes of Egypt under the Pharaohs. Antiquarians and Egyptologists seem in the main to have contented themselves with calling an animal a gazelle, an antelope, or a deer, without the slightest attempt to ascertain whether such titles are correctly bestowed, and in some cases utterly oblivious of the fact that deer (with the exception of the Barbary red deer and the fallow-deer in Tunisia, Algeria, and Morocco) are quite unknown in the African continent. A remarkable instance of this occurs in a comparatively recent publication of the Egypt Exploration Fund, forming the eighth memoir of the Archæological Survey of Egypt, entitled "The Mastaba of Ptahhetep . . . at Saggareh. Part i. The Chapel of Ptahhetep and the Hieroglyphs," by N. de G. Davies. Here a plate depicting a number of antelopes and goats is lettered "The Deer—East Wall." A moment's consultation with a naturalist friend would, of course, have saved the author from this absurd error.

Many of the animals represented in the sculptures and frescoes are obviously mythical; but others equally clearly represent species then living in the country, and these are for the most part so well and characteristically represented, that in many cases there is little or no difficulty in identifying the species to which they belong. Apart from the intrinsic interest of identifying the various species portrayed, a certain amount of information may at the same time be obtained with regard to the former distribution of the species in question, so that the investigation of the subject has considerable scientific interest.

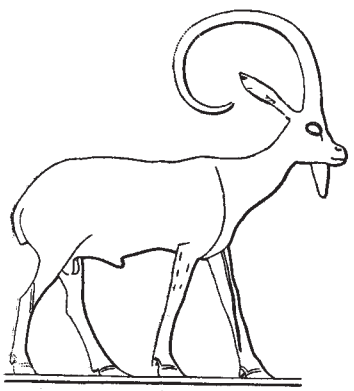

FIG. 1.—Nubian ibex, from the Ptahhetep Chapel.

With these few preliminary observations, I proceed at once to the consideration of such figures as I have been able to identify with more or less certainty, merely adding that these for the most part represent ungulates, the portraits of Carnivora being far more difficult to assign to their respective species.

Commencing with the above mentioned figures from the east wall of the Chapel of Ptahhetep, for copies of which I am indebted to Mr. F. Ll. Griffith, the editor of the publication cited, there is no difficulty in identifying Fig. 1 with the Arabian, or Nubian, ibex (*Capra nubiana*). Although the knotted ridges on their front surfaces are not shown, the circular sweep of the horns is unmistakable, while further evidence for the specific identification is afforded by the long and pointed beard on the chin. It is, however, somewhat remarkable that in another representation of the same animal, from a hunting-scene on the east wall of this chapel, the beard is omitted; possibly one figure represents the animal in the summer dress, and the other in the winter coat. The shortness of the tail in both figures may be cited as a further instance of the artist's fidelity to nature.

Equally unmistakable and characteristic is the portrait of the aoul, or Soemmerring's gazelle (*Gazella soemmerringi*), which is reproduced in Fig. 2. The characteristic inward curvature of the tips of the horns is remarkably well shown, although the relative length of these appendages appears to be somewhat exaggerated. Contrasted with the figure of the ibex, the gazelle-like slenderness and length of limb, as well as the lightness of the whole build, are remarkably well brought out in this portrait. The short tail is also a characteristic gazelle feature. Soemmerring's gazelle, it may be observed, is still fairly abundant in Upper Nubia, and in past times may have been found much lower down the Nile delta.

The next three figures from the Ptahhetep Chapel represent long-tailed antelopes. Of these, the one shown in Fig. 3 is, I take it, probably the lesser kudu (*Strepsiceros imberbis*), if not this, the Abyssinian bushbuck (*Tragelaphus scriptus*); the length and strong twist of the horns render it, however, probable that the picture is intended for the former animal. The absence of a tuft of hair on the throat, as well as the relative size of the drawing and the narrowness of the ears, clearly show that the portrait is not intended for the greater, or true, kudu. Neither the lesser kudu nor the bushbuck are now known from Egypt, although they occur in Somaliland, Abyssinia, and probably Kordofan. The abundant hairing of the lower part of the tail is clearly indicated in the figure.

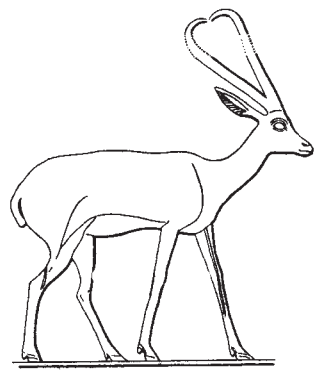

FIG. 2.—Soemmerring's gazelle, from the Ptahhetep Chapel.

From the spiral twist and length of the backwardly sweeping horns, the stout build, and the length of the tail, there can be little doubt that the animal portrayed in Fig. 4 is an addax (*Addax nasomaculatus*), a species of antelope met with at the present day throughout the desert tracts of northern Africa. The artist, it will be noticed, has made the profile of the face markedly concave, and thereby different from that of any of the other antelopes depicted.

Equally characteristic of the north African desert zone is the white, or sabre-horned, oryx (*Oryx leucoryx*), which differs from the other members of its tribe by the long horns sweeping backwards in a bold and graceful curve, instead of rising nearly straight up from the forehead. These features, as well as the long and thickly haired tail, are clearly represented in the portrait reproduced in Fig. 5, which may unhesitatingly be admitted to indicate the species in question. The white oryx is still a comparatively common antelope in the deserts of Upper Nubia and Kordofan. From the nearly straight and more strongly ringed horns, a figure of another antelope in the hunting-scene on the east wall of the Ptahhetep Chapel is intended, I think, for the beisa oryx (*Oryx beisa*), which ranges from the Red Sea littoral in the neighbourhood of Suakim through Abyssinia to Somaliland and north-east Africa generally.

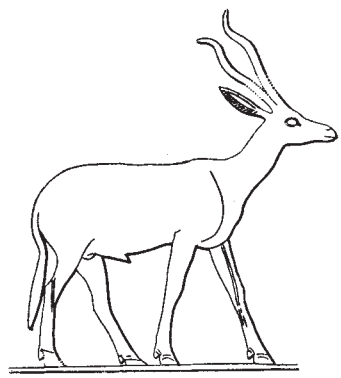

FIG. 3.—Lesser kudu (?) from the Ptahhetep Chapel.

Antelopes of other kinds, including some of the smaller gazelles, are recognisable on various Egyptian frescoes, but their exact specific determination is difficult or impossible. Cattle are frequently depicted, but all appear to be domesticated animals, none of which belong to the humped breed, now so common in Africa. Camels are occasionally represented, but there is nothing to show that these indicate the existence of this animal in a wild state in the country at that date; most probably, indeed, they are domesticated specimens. Very interesting, in a scene representing tribute-bearers from Cush (Goss's "Ancient Egypt," p. 37), is the portrait of a giraffe with a dog-faced baboon clinging to its throat. Curiously enough, the giraffe is

represented with the legs spotted right down to the hoofs, after the fashion of the southern races of this species, and unlike the Nubian form, in which the spotting stops short at the knees and hocks. It must be acknowledged, however, that the artistic merit and attention to details are nothing like so good in the Cush tribute scene as in the Ptahhetep frescoes.

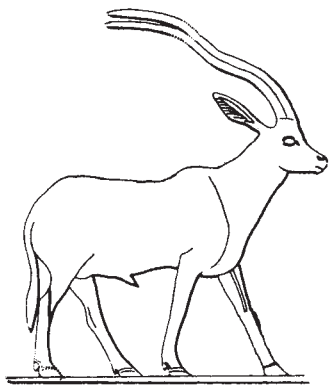

FIG. 4.—Male addax, from the Ptahhetep Chapel.

Among the Carnivora, the lion and the leopard are frequently depicted, but in the aforesaid frescoes of the tribute-bearers from Cush, the spots of the latter animal are represented as more like those of the ocelot. As might have been expected, the ichneumon, or Egyptian mungoose (*Herpestes ichneumon*), the snake-destroying propensities of which render it so venerated among the inhabitants of the Nile delta, is very frequently represented in the frescoes. It is well shown in Fig. 6, *A*., from the Ptahhetep hunting-scene. The fore part of the animal shown at *D* in the same figure seems to be intended for the little African fennec fox (*Canis famelicus*), the projecting appendix seen below the eye in the figure being apparently a conventional mode of representing the bristles or "whiskers," which are remarkably well developed in that species.

The long-tailed and long-hind-legged animal shown at *B* in Fig. 6 is apparently the lesser, or hairy-footed, jerboa (*Jaculus hirtipes*), the small size of the ears showing that it is not intended for the larger jerboa (*Jaculus aegyptiacus*). Another rodent shown in some of the frescoes, as in one of labourers bringing in sheaves of corn (Goss, *op. cit.* p. 195), is the Egyptian hare. The length of the ears, by which the animals are being carried, is, however, greatly exaggerated, the length of these appendages being nearly equal to that of the head and body.

A remarkable instance of fidelity to nature occurs in the two portraits of a hedgehog shown at *C* in Fig. 6, from the Ptahhetep hunting-scene, one of these representing the animal standing in the open, and the second showing it coming out of a hole with a locust in its mouth. The well developed ears clearly show that the species depicted is the long-eared hedgehog (*Erinaceus auritus*), which differs from its European cousin by the large size of the ears.

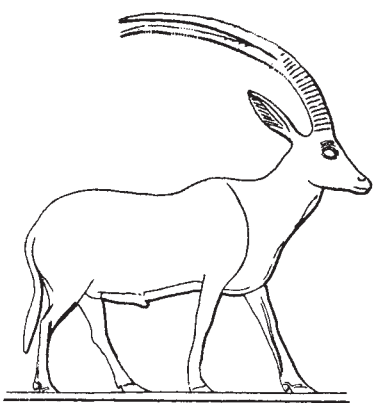

FIG. 5.—White oryx, from the Ptahhetep Chapel.

Turning to certain sculptures from Assyria, Babylonia and other parts of western Asia, I may in the first place direct attention to an illustration in Vaux's "Nineveh and Persepolis," entitled "Figure Carrying Gazelle," which is reproduced in the accompanying cut (Fig. 7). The original slab, which is preserved in the British Museum, was one of those obtained from the palace at Nimroud by Sir Henry Layard, in whose own work it bears the above-mentioned legend. Clearly such a title does manifest injustice to the genius and fidelity to nature of the ancient sculptor, who has faithfully portrayed the palmated and branching antlers and dappled hide of a fallow-deer, spots being, it is almost unnecessary to mention, quite unknown in any species of gazelle. The interest of this sculpture does not, however, by any means end here, for the details of the antlers and other features are sufficient to show that the species portrayed is evidently the Mesopotamian fallow-deer (*Cervus mesopotamicus*), which is a native of the Luristan province of Mesopotamian Persia, and was first definitely made known to European science by the late Sir Victor Brooke in 1875. That a species should have been thus clearly portrayed centuries and centuries ago by a sculptor of the

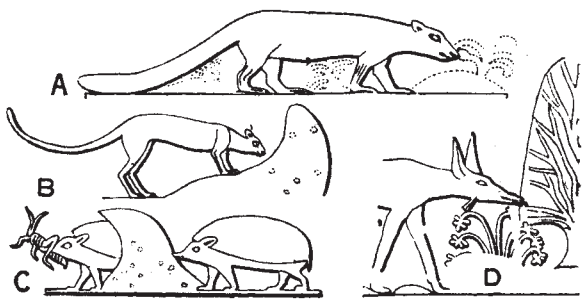

FIG. 6.—Small mammals from the Ptahhetep Chapel. A, Ichneumon; B, Lesser jerboa; C, Hedgehog: D, Fennec.

Babylonian era, and should have remained unknown in western Europe until the close of the third quarter of the nineteenth century, is certainly a curious feature in the progress of human knowledge.

Of minor interest is another slab from Nimroud of which a cut appears in Vaux's above-mentioned volume, where it is lettered "Figure Carrying a Goat." The form of the horns, the general contour of the animal, and, above all, the absence of a beard on the chin, indicate, however, that the sculptor has represented one of the gazelles, which is probably the common Dorcas gazelle (*Gazella dorcas*), which at the present day has a wide distribution in North Africa, whence it extends into Palestine and Syria. It is, however, possible that the figure may be intended for the goitred gazelle (*Gazella subgutturosa*), which ranges from the Caucasus through Persia and Syria, and thence into Central Asia, where it is represented by a distinct local race.

FIG. 7.—Human figure carrying Mesopotamian fallow deer, from the Palace at Nimroud.

The last, but by no means the least interesting, sculpture to which I shall allude is one from Nimroud of which a woodcut appears on p. 225 of the work above cited, where it is described as a "Bull-hunt." The horns of the animals depicted are, however, as shown in the accompanying reproduction of the cut (Fig. 8), quite unlike those of the bulls represented in the Egyptian frescoes, and strongly recall those of the white-tailed gnu (*Connochaetes gnu*) of South Africa. Moreover, the tails of these animals are of the same type as those of the horses shown in this and other sculptures, and are quite different from those of the oxen of the sculptures and frescoes, which have a somewhat club-shaped form. It would appear, therefore, that the portrait is that of an animal with a fully haired tail

like a gnu or horse, and not one with a terminally tufted tail of the ox type. Again, the general form of the animal is much more like that of a gnu than of a bull.

Accordingly, there appears a very strong presumption that this sculpture represents the hunting of a species of gnu, and if this be really the case, it would be a fact of very considerable interest in connection with animal distribution. The two living species of gnu are now confined to Africa, but their near relatives, the hartebeests, range into Syria, while fossil species of that group, as well as of other antelopes of an African type, occur in the Upper Tertiary strata of northern India and China. Nothing is therefore more likely than that gnus should have formerly

Bull Hunt.

FIG. 8.—A gnu (?) hunt, from Nimroud.

had a more extensive range. If this be so, it would be one more argument in favour of the old view that the present antelope fauna of Ethiopian Africa immigrated into the country from the north, and against the modern theory of its autochthonous origin in Africa itself. For it is surely much more probable that animals should have died out in their ancient habitat and flourished in the country in which there are comparatively new arrivals rather than the converse.

A more extensive and detailed study of the old Assyrian and Babylonian sculptures and of the Egyptian frescoes would doubtless lead to the identification of species of animals other than those mentioned above; but such identifications as I have been able to make are sufficient to demonstrate that the subject has a definite bearing on the past distributional history of mammals, and that it ought not to be neglected by students of that branch of zoology.

R. LYDEKKER.

THE ACTION OF RADIUM EMANATIONS ON DIAMOND.[1]

WHEN diamonds are exposed to the impact of radiant matter in a high vacuum they phosphoresce of different hues, and assume a dark colour, becoming almost black when the bombardment is long continued (*Phil. Trans.*, 1879, part ii., p. 658, par. 625).

Some diamonds blacken in the course of a few minutes, while others require an hour or more to discolour.[2] This blackening is only superficial, and although no ordinary means of cleaning will remove the discoloration, it goes at once when the stone is polished with diamond powder. The fact that the black stain is not affected by ordinary oxidising reagents would seem to show that it is not due to a layer of amorphous carbon; but it might be graphite, which is much more resistant to oxidation. Becquerel has shown that graphite is converted into graphitic oxide by long digestion in a warm mixture of potassium chlorate and strong nitric acid, while diamond—even in a very finely powdered state—is absolutely unaffected by the mixture (*Ann. de Chim. et de Phys.*, [4], vol. xix. p. 392).

Some forms of graphite dissolve in strong nitric acid; others require a mixture of highly concentrated nitric and potassium chlorate to dissolve them, and even with this intense oxidising agent some graphites resist longer than others. M. Moissan has shown that the power of resistance to nitric acid and potassium chlorate is in proportion to the temperature at which the graphite has been formed, and with reasonable certainty we can estimate this temperature by the resistance of the graphite to this reagent.

Judging from the long time required to remove the superficial darkening from diamond, the graphite is as resistant as that formed at the temperature of the electric arc.

On one occasion when I had blackened the surfaces of diamonds by molecular bombardment *in vacuo* M. Moissan was present, and took some away with him for further examination. He subsequently reported the results in the *Comptes rendus*, vol. cxxiv., No. 13. He heated the diamond to 60° in an oxidising mixture of potassium chlorate and fuming nitric acid prepared from monohydrated sulphuric acid and potassium nitrate fused and quite free from moisture. The action on the black layer is very slow. There is produced graphitic oxide, which at an increased temperature yields pyrographitic acid, which is easily destroyed by nitric acid. Hence the variety of carbon which coated the diamond was graphite. The transformation of diamond into graphite requires the high temperature of the electric arc. The higher the temperature to which graphite is raised the greater is its resistance to oxidation. M. Moissan concludes that the temperature reached by the surface of the diamond in my radiant matter tubes is probably about 3600°.

The β-rays from radium having like properties to the kathode stream in a radiant matter tube, it was of interest to ascertain if they would exert a like difference on diamond. Two Bingara diamonds, A and B, weighing respectively 0·960 and 1·020 grains, were selected as near as the eye could judge of the same size and colour—very pale yellow, technically known as "off colour." Diamond A was put in a drawer far removed from radium or any radio-active body. Diamond B was kept close to a quartz tube containing about 15 milligrams of pure radium bromide sealed *in vacuo*. It phosphoresced brightly and continued to glow the whole time of the experiment.

After a fortnight the two diamonds were put side by side and compared. I could see no appreciable difference in colour between them. Diamond B was now replaced close to the quartz tube of radium, and they were kept in contact for six weeks. At the end of that time examination again showed scarcely any difference between the two. The one which had been near the radium might be a little the darker of the two, but the difference was too slight to enable me to speak positively.

Diamond B was now put inside a tube with radium bromide, the salt touching it on all sides, as it was thought possible that a screen of quartz might interfere with the passage of emanations which would act on the diamond. The comparison diamond was kept removed from the emanations as before. The experiment was continued for seventy-eight days, when the two diamonds were again examined. There was now a decided difference in colour between them; diamond A was of its original pale yellow "off colour," and diamond B was of a darker appearance and of a bluish tint, with no yellow colour apparent.

It thus appears that the property which radium emanations possess of darkening transparent bodies which they impinge upon—a property very marked in the case of glass, and less with quartz—also holds good in the case of diamond.

Diamond B was now heated to 50° C. in a mixture of strongest nitric acid and potassium chlorate for ten days, the mixture being renewed each day. At the end of this time the diamond had lost its dull surface colour, and was as bright and transparent as the other stone, but its tint had changed from yellow to a pale blue-green.

The radium emanations have therefore a double action on the diamond. The β-rays (electrons) effect a superficial darkening, converting the surface into graphite in a manner similar to, but less strongly than, the more intense electrons in the kathode stream. But the alteration of the body colour of the stone by emanations which are obstructed by the thinnest film of solid matter, even by a piece of thin paper, is not so easy to understand. A superficial action might be expected, but not one penetrating through the whole thickness of the diamond. I believe the alteration

[1] Read before the Royal Society on June 16 by Sir William Crookes, F.R.S.

[2] At a lecture before the Royal Institution on June 11, 1897, I exposed a flat macle crystal of diamond to radiant matter bombardment before the audience for about five minutes, a strip of metal covering part of the stone. On removing the diamond from the vacuum tube and projecting its image on the screen with the electric lantern, the image of the darkening was very apparent.